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(54) **PLUMBING LEAK TESTING APPARATUS**

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See application file for complete search history.

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(57) **ABSTRACT**

A plumbing pipe plug apparatus configured for insertion into a section of pipe and adapted to radially expand so as to engage the inner surface of the pipe and form a positive seal therewith is disclosed. The pipe plug is adapted with a conduit having a check valve that opens in response to fluid pressure to enable the injection into the plumbing system of a pressurized fluid, such as water, to pressurize the system downstream of the plug to allow for leak inspection and pressure testing.

5 Claims, 10 Drawing Sheets

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

10
14
12
32
36
32
20
39
42
Water pressure fills chamber and expands it
Break valve is closed until pressure builds up high
Unit expands and seals pipe
Break pressure opens valve
Water fills test pipe

Fig. 7

Fig. 8

Fig. 9

Fig. 10

PLUMBING LEAK TESTING APPARATUS

CROSS REFERENCE TO RELATED APPLICATIONS

N/A

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

N/A

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BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a pipe leak testing apparatus, and more particularly to a plumbing pipe plug for testing plumbing systems for fluid integrity.

2. Description of Related Art

Plumbing and piping systems are typically constructed by connecting sections of pipe with fittings, valves, and other accessories. It is customary for plumbing systems to be pressure tested for leaks prior to entering service. Such tests require that the plumbing system, or a section thereof, be pressurized and inspected for leaks. In addition, it is often necessary to isolate a section of pipe for various reasons. For example, maintenance matters and safety considerations often require that a particular section of pipe connected to a system be isolated from the rest of the system while work is being performed.

Accordingly, there exists a need for an easy to install pipe test plug for isolation of piping systems during testing, repair and maintenance, for bypassing of damaged lines, and for isolation of piping systems during construction. More particularly, there exists a need for a pipe plug apparatus configured for insertion into a section of pipe and adapted to radially expand so as to engage the inner surface of the pipe and form a positive seal therewith. There further exists a need for such an apparatus wherein a pressurized fluid, such as water, may be injected into the pipe system to pressurize the system to allow for leak inspection and pressure testing.

BRIEF SUMMARY OF THE INVENTION

The present invention addresses the needs in the art by providing a plumbing pipe plug apparatus configured for insertion into a section of pipe and adapted to radially expand so as to engage the inner surface of the pipe and form a positive seal therewith. The plumbing pipe plug is further adapted to enable the injection into the plumbing system of a pressurized fluid, such as water, to pressurize the system downstream of the plug to allow for leak inspection and pressure testing.

Accordingly, it is an object of the present invention to provide a plumbing leak detection apparatus.

Another object of the present invention is to provide a plumbing pipe plug apparatus configured for insertion into a section of pipe and adapted for radial expansion to form a seal.

Still another object of the present invention is to provide a plumbing pipe plug apparatus adapted for pressurizing a section of pipe by forming a positive seal while providing a conduit for a pressurized fluid, such as water, to enter the pipe.

In accordance with these and other objects, which will become apparent hereinafter, the instant invention will now be described with particular reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. **1** depicts a side view of a plumbing pipe plug apparatus according to the present invention;

FIGS. **2** and **3** are perspective views thereof;

FIGS. **4–6** are perspective sectional views thereof;

FIG. **7** is a sectional view depicting fluid flow and a descriptive flow chart; and

FIGS. **8–10** illustrate the plumbing pipe plug apparatus inserted within a section of pipe.

DETAILED DESCRIPTION OF THE INVENTION

With reference now to the drawings FIGS. **1–10** depict a plumbing pipe plug apparatus, generally referenced as **10**, according to the present invention. Plumbing pipe plug apparatus **10** is generally cylindrically shaped for insertion within a section of pipe or tubing. Pipe plug **10** relies primarily on pneumatically actuated radial expansion to form a seal with the inner surface of a pipe or tube. More particularly, pipe plug **10** includes a cylindrical conduit **12** axially disposed within a generally cylindrical, pneumatically expandable body **14** configured for manual insertion in, and sealing engagement with a section of pipe. Referring to FIG. **1**, pipe plug **10** has a pneumatically expandable body **14** in the form of a pneumatic expandable bladder that has a diameter and length suited to the general diameter of the pipe or tubing in which it is installed for operation. Expandable body **14** includes an inlet port **16**, that preferably comprises a schrader valve to facilitate connection to a hose from a compressed air source for filling expandable body **14** with air so as to effect radial expansion thereof. Accordingly, inlet port **16** functions as a connection port for connection of a hose for filling expandable body **14** with a fluid, such as compressed air. The selective introduction of compressed air via inlet port **16** functions to cause radial expansion of body **14** until the peripheral edge of body **14** engages the inner wall of the conduit and forms a positive seal.

Pipe plug apparatus **10** further includes a rigid cylindrical conduit **12**, axially disposed relative to body **14**. Rigid cylindrical conduit **12** includes an inlet **20** and an outlet **22**. Inlet **20** is preferably threaded and outlet **22** may be threaded as best depicted in FIG. **5**. Inlet **20** provides a connection port for connection of a hose **23** in fluid communication with a pressurized fluid source, such as a source of pressurized water, for pressurizing the pipe downstream of the plug. More particularly, once the apparatus is inserted into a vertical section of pipe and a seal is formed by radial expansion of body **14**, water may be injected above the apparatus thereby pressurizing the pipe to allow for leak testing.

Conduit **12** further includes a spring biased valve assembly, generally referenced as **30**, disposed therein. Valve assembly **30** functions as a back flow prevention device or check valve to allow water under sufficient pressure to flow into the pipe downstream of the plug via conduit inlet **20** and outlet **22**, while preventing backflow. More particularly, valve assembly **30** includes first and second mounting plates, referenced as **32** and **34** respectively, and an elongate rod **36** received within axial apertures on the mounting plates so as to be axially disposed in slidable engagement with mounting plates **32** and **34**. Each mounting plate **32** and **34** defines an axial aperture for receiving rod **36** and a plurality of radially spaced apertures **38** to allow for fluid flow past each plate. Rod **36** further includes a valve body **39** sized and shaped for seated sealing engagement with conduit end **22**. As best depicted in FIG. **5**, the valve assembly **30** is biased to a closed position by a helical spring **40** disposed in surrounding relation with rod **36** between a stop **42** connected to the rod and plate **34**. Helical spring **40** thus biases the valve assembly **30** to a closed configuration wherein valve body **39** is sealingly seated within outlet **22** thereby preventing backflow. In addition, when hose **23** is connected to inlet **20** and pressurized water flows into conduit **12**, through plate apertures **38**, the pressure acting on valve body **39** causes valve assembly **30** to open by unseating the valve body from its sealed configuration thereby allowing water to flow through the apparatus into the pipe system. When the user turns the water supply off, spring **40** causes valve body **39** to retract to the seated position thereby closing valve assembly **30** and maintaining the pressure within the downstream pipe system by preventing backflow. The valve assembly may be manually opened by the user by pushing on knob **42** on rod **36** thereby unseating valve body **39** and effectively opening the valve.

As best illustrated in FIGS. **8–10**, leak testing apparatus **10** is employed by first inserting apparatus **10** into a section of pipe and inflating expandable body **14** by connection of a compressed air hose to schrader valve **16** thereby causing body **14** to radially expand until sealing engagement is achieved with the inner surface of the surrounding pipe. A water hose **23** is then threadably connected to conduit end **20** and water flow is initiated. Water flows through conduit **12** and plate apertures **38** until reaching valve body **39** wherein the water pressure acts on the valve assembly by overcoming the biasing force thereby forcing valve body **39** from its seated configuration to a longitudinally spaced open configuration whereby water is allowed to flow out of outlet **22** into the pipe system. Once sufficient water is introduced though apparatus **10** into the pipe system to adequately pressurize the system water flow is terminated and spring **40** retracts valve body **39** to the seated position thereby closing the valve and maintaining pressure on the pipe system downstream of apparatus **10**. After leak testing is completed water may be drained from the pipe system by pushing knob **42** projecting from inlet end **20** so as to unseat valve body **39** thereby opening the valve and allowing water to flow from the pipe system in reverse flow via outlet **22** conduit **12** and inlet **20**. Finally, the user bleeds air from expandable body **14** using Schrader valve **16** thereby contracting body **14** such that the apparatus may be removed from the pipe section.

The instant invention has been shown and described herein in what is considered to be the most practical and preferred embodiment. It is recognized, however, that departures may be made therefrom within the scope of the invention and that obvious modifications will occur to a person skilled in the art.

What we claim is:

1. A pneumatic pipe plug apparatus comprising:

an expandable body having first and second ends, said second end having an inlet valve for connection to a compressed gas source, said body capable of radial expansion upon introduction of a compressed gas;

a conduit axially disposed relative to said expandable body, said conduit having an inlet disposed proximal said body second end and an outlet disposed proximal said body first end;

said conduit including a valve movable from a closed position to an open position; and

a spring configured for biasing said valve to said closed position, said valve adapted to open in response to fluid pressure applied to said conduit inlet;

said valve further including a manual actuator projecting from said conduit for opening said valve upon manual actuation thereof.

2. A pneumatic pipe plug apparatus according to claim **1**, wherein said expandable body inlet valve is a schrader valve.

3. A pneumatic pipe plug apparatus comprising:

an expandable body having first and second ends, said second end having a compressed gas valve for connection to a hose in fluid communication with a compressed gas source, said body capable of radial expansion upon introduction of a compressed gas through said compressed gas valve;

a conduit axially disposed relative to said expandable body, said conduit having an inlet disposed proximal said body second end and an outlet disposed proximal said body first end;

said conduit inlet having a female threaded connector;

said conduit including a valve biased to a closed position by a spring, said valve adapted to automatically open in response to fluid pressure applied to said conduit inlet thereby allowing fluid to flow through said conduit from said inlet and out said outlet.

4. A pneumatic pipe plug apparatus according to claim **3**, wherein said conduit valve further includes manual means for opening said valve.

5. A pneumatic pipe plug apparatus according to claim **4**, wherein said manual means for opening said valve includes a push rod having a first end connected to an openable valve body and a second end projecting from said expandable body second end, whereby manually pushing on said rod second end opens said valve.

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